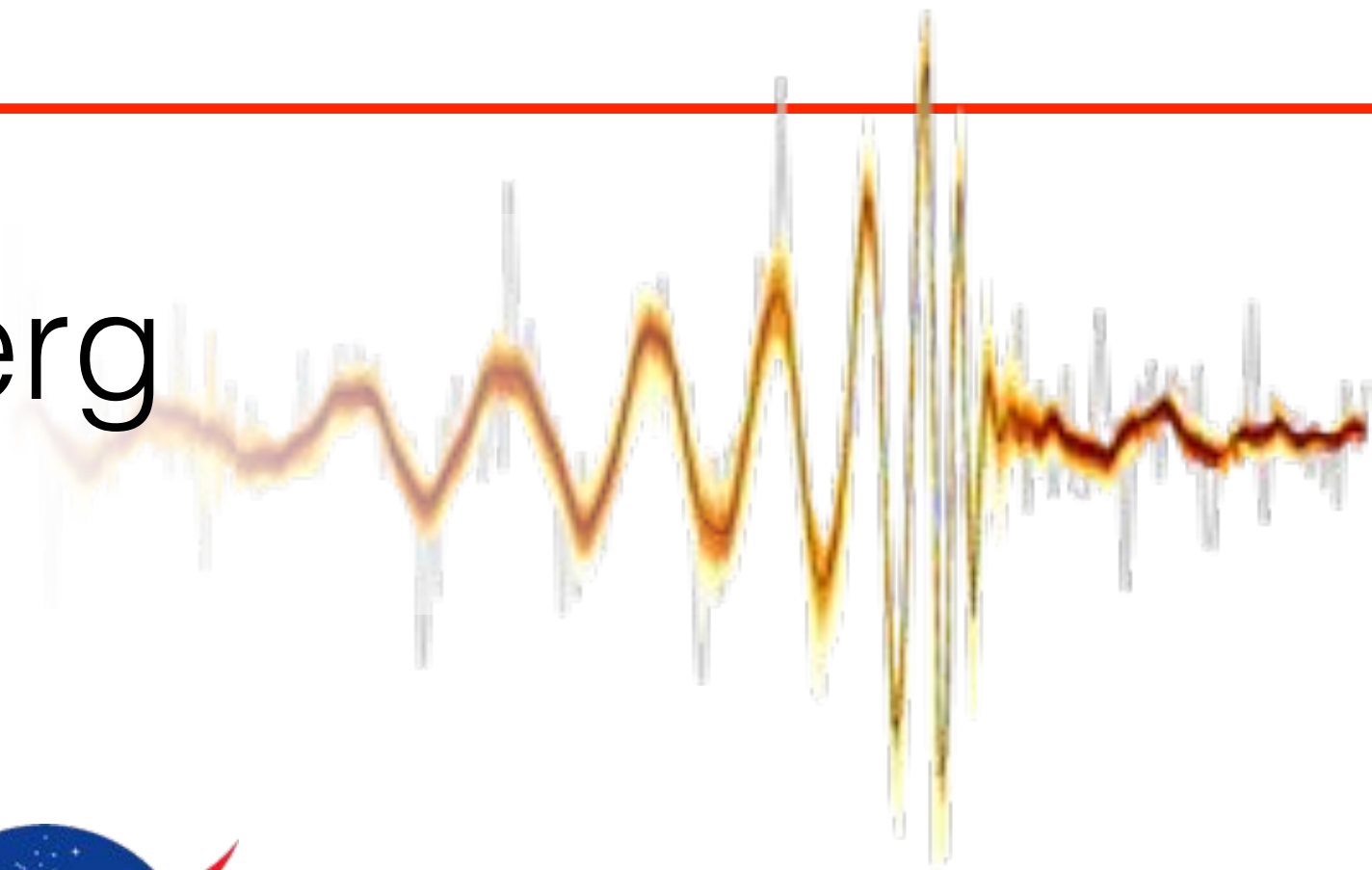


Gravitational Wave Astronomy

Tyson B. Littenberg

NASA/Marshall Space Flight Center



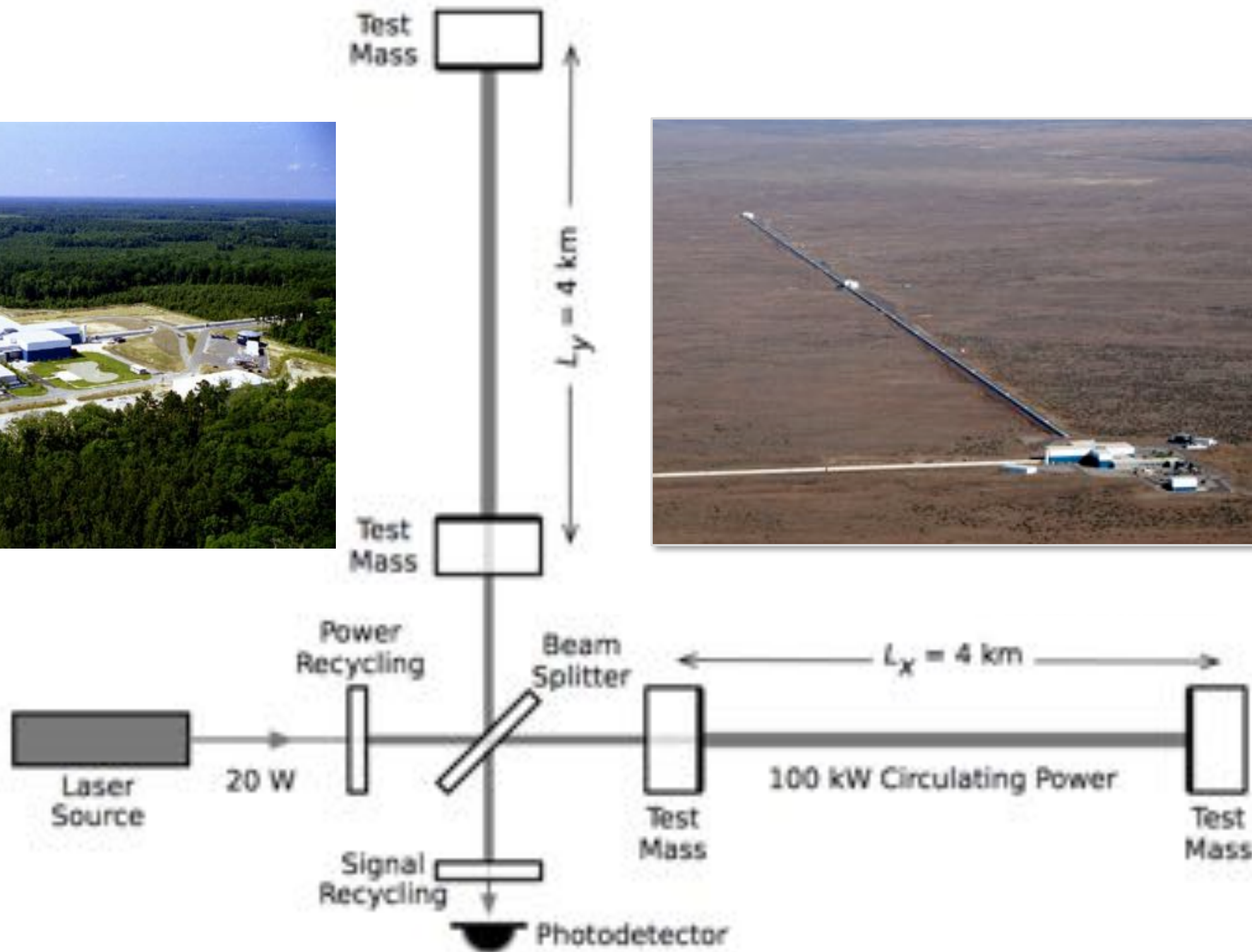








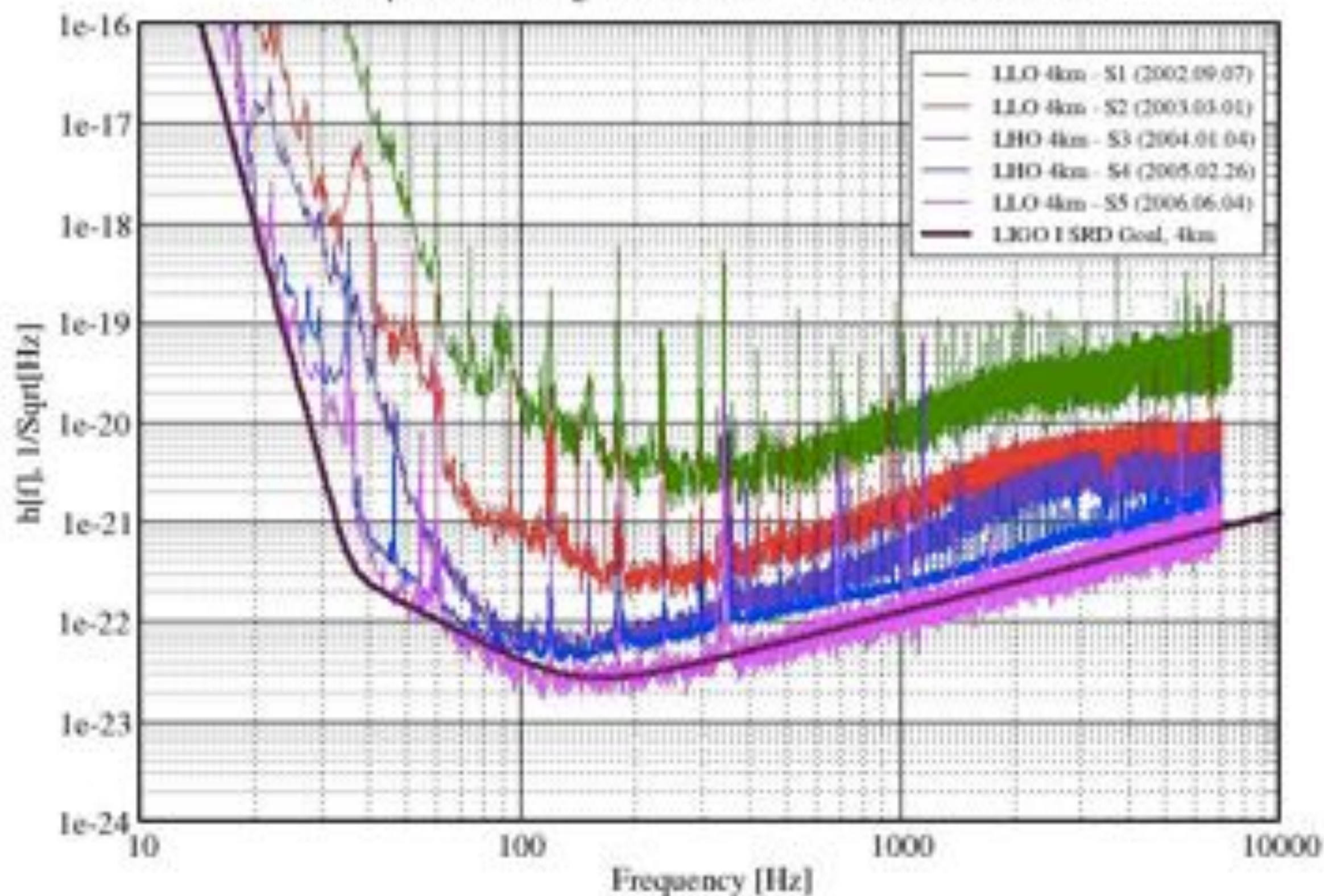
LASER
INTERFEROMETER
GRAVITATIONAL
WAVE
OBSERVATORY

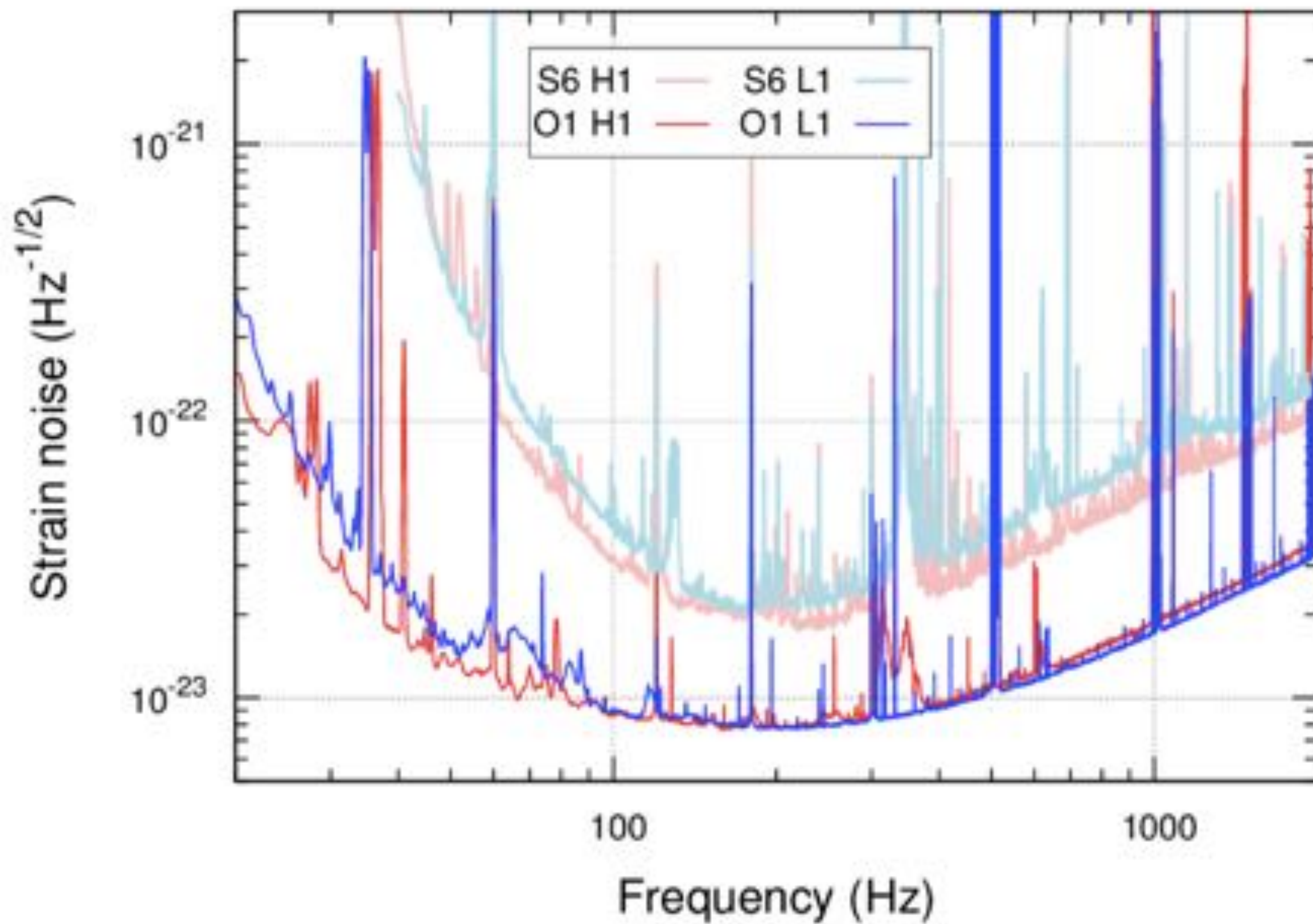




Best Strain Sensitivities for the LIGO Interferometers

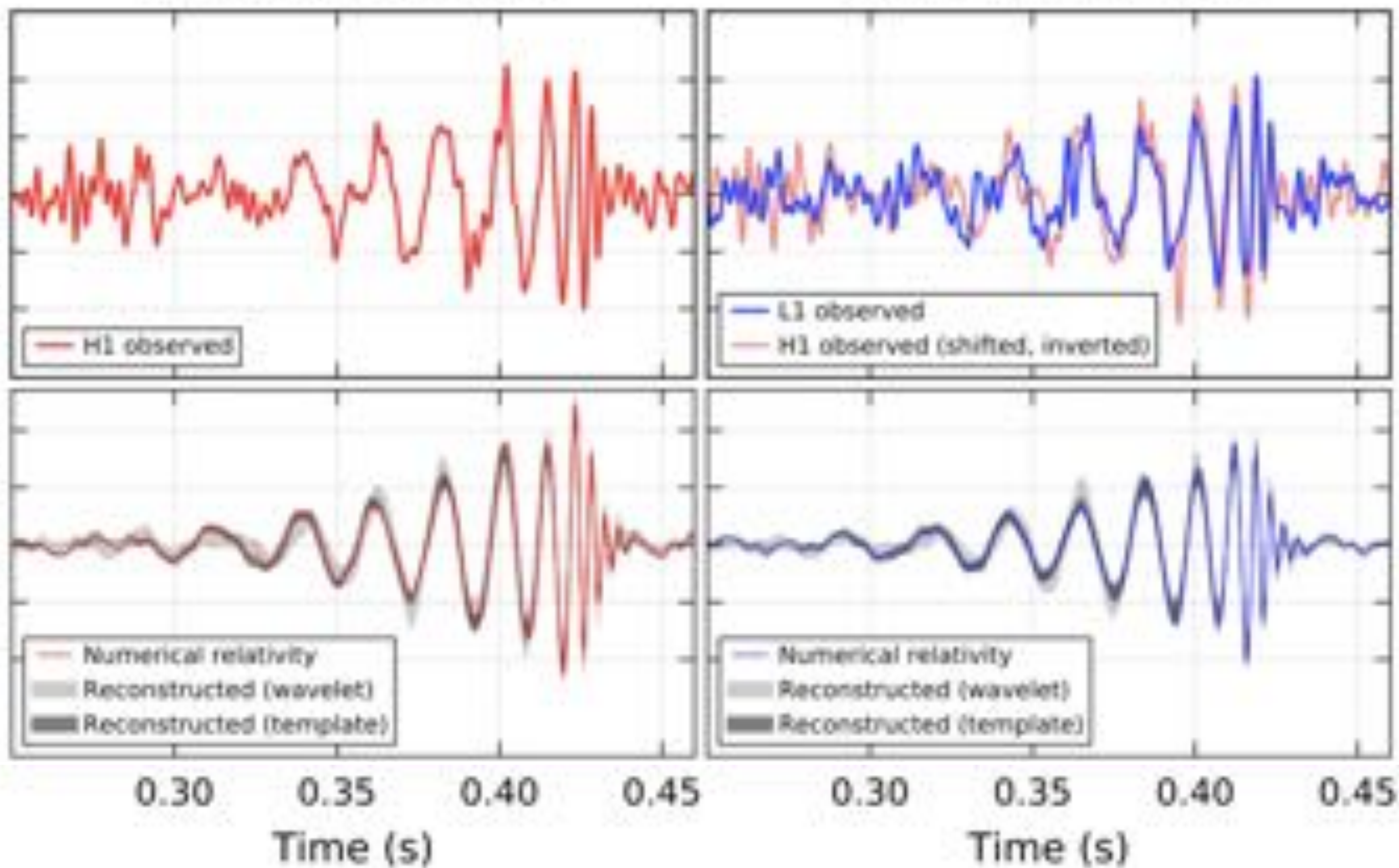
Comparisons among S1 - S5 Runs LIGO-G060009-02-Z





Hanford, Washington (H1)

Livingston, Louisiana (L1)



Instrument

Measurement

Multimessenger

Interpretation



The Bakersfield Californian
FRIDAY, FEBRUARY 12, 2016 • BAKERSFIELD.COM

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MAKING WAVES

Gravitational waves, that is: New scientific observation affirms Einstein's general theory of relativity
USA TODAY | 30

Lawsuit disputes union access to farms

Practitioner violates laborers' constitutional protections, challenge claims, if successful, will could hamper efforts by United Farm Workers to connect with ag laborers
LOCAL | 2

At Democratic debate, Sanders, Clinton spar over plans for change
USA TODAY | 28

It-rained 'Deadpool,' starring Ryan Reynolds, winks at the shallow and
USA TODAY | 28

Bakersfield High captures 17th straight

The Huntsville Times

Huntsville ready to welcome Uber, Lyft and Zipcar

UAH 'AT THE CENTER' OF CONFIRMING EINSTEIN'S THEORY OF RELATIVITY

Lawmakers hold key to building mega-prisons

The Washington Post

Deadly prison riot in Mexico

U.S., Russia agree to a halt in Syrian war

Ex-wife's tip led to capture of Md. Panera

Fault line spotlighted in Wis. debate

Oregon siege ends as four surrender

Gravitational waves

The New York Times

Climate Panel Sees Plan to Overhaul

Long in Chinese Courts, Black Notice Sued

Lost Daughter Is Found, Groggily & Guarded

WEEKEND UPDATE: VON MILLER

The Denver Broncos linebacker and Super Bowl MVP discusses the discovery of gravitational waves.
(Season 42, 2016)

Measure to alter lottery scholarship funding advances

As more wash ashore, severed feet pose mystery in Pacific Northwest

Surprise your loved one this Valentine's Day

Let Pinner's Flower Shop Deliver your Valentine!



Measure to alter lottery scholarship funding advances

As more wash ashore, severed feet pose mystery in Pacific Northwest

Surprise your loved one this Valentine's Day

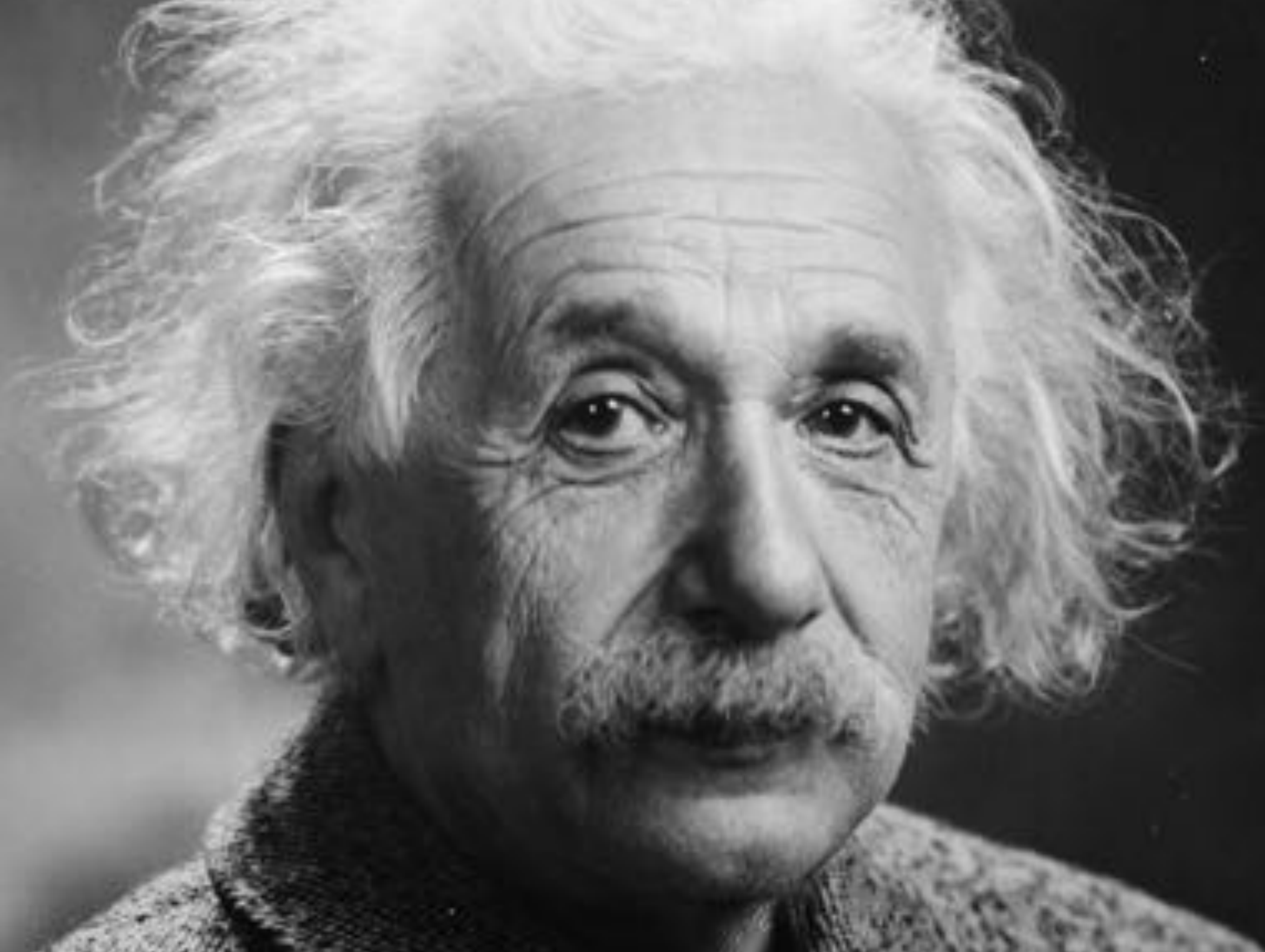
Surprise your loved one this Valentine's Day

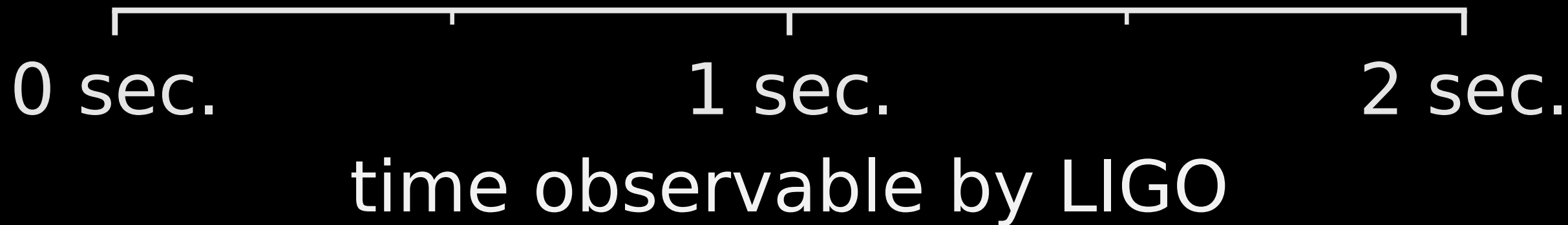
Let Pinner's Flower Shop Deliver your Valentine!

Let Pinner's Flower Shop Deliver your Valentine!

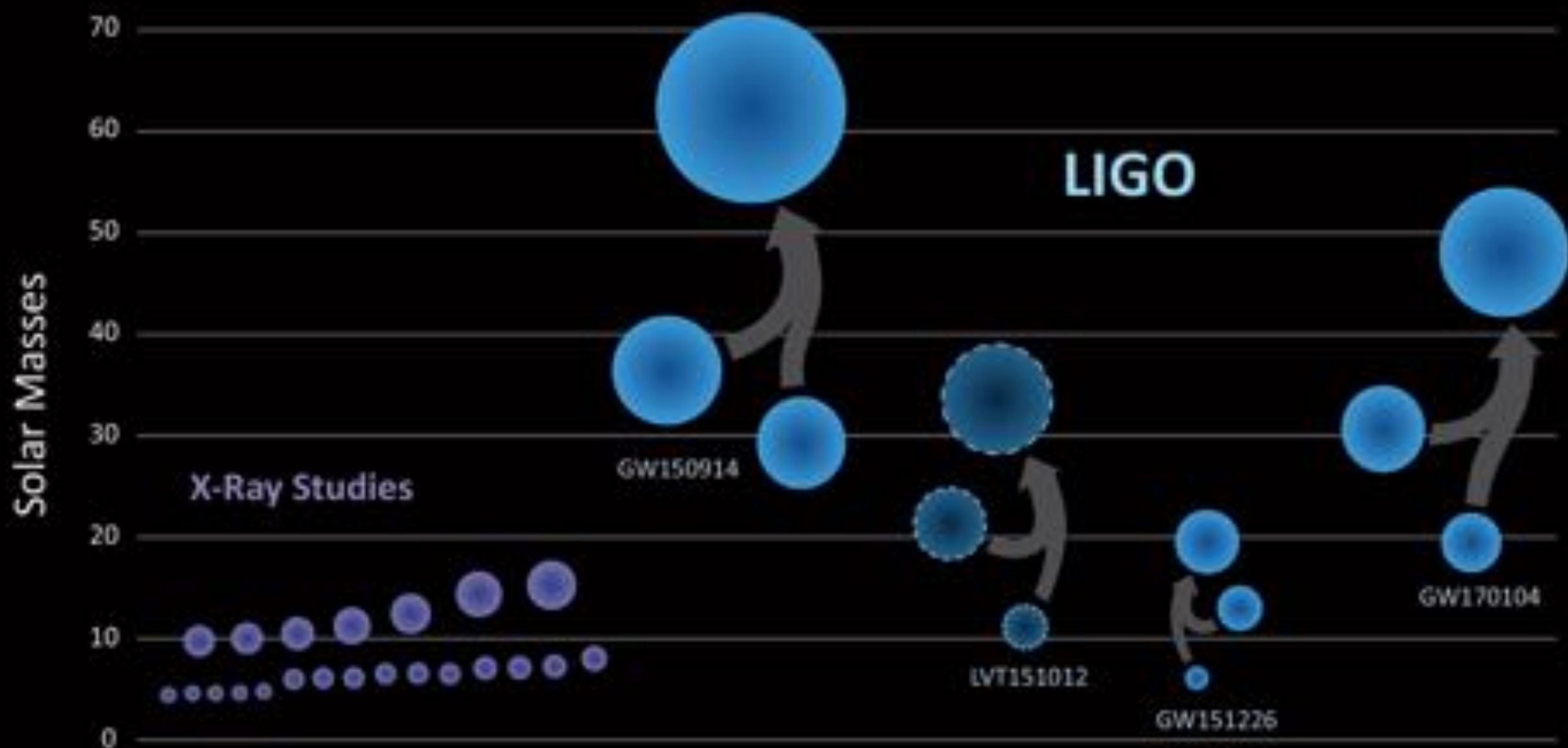
PERSON'S

SLEEPY'S
The Mattress Professionals
Doorbusters 6 Hours Only!
SATURDAY 10AM-4PM



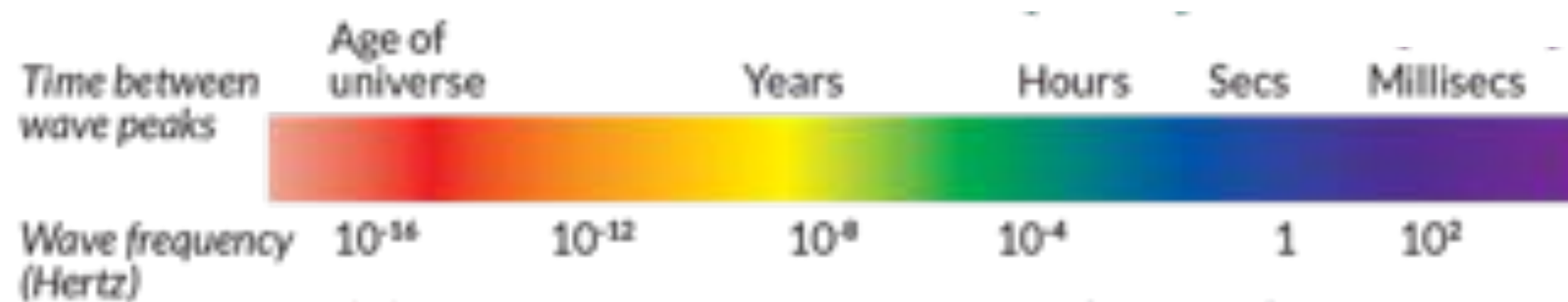


Black Holes of Known Mass

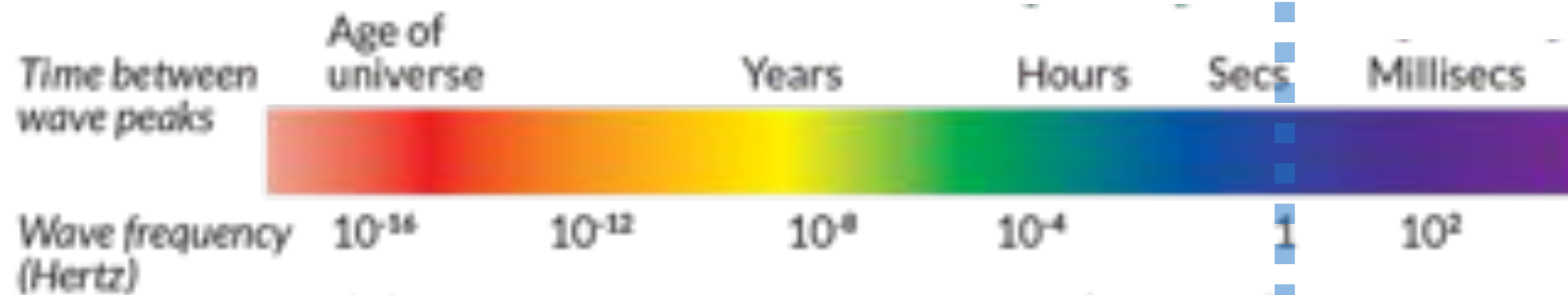




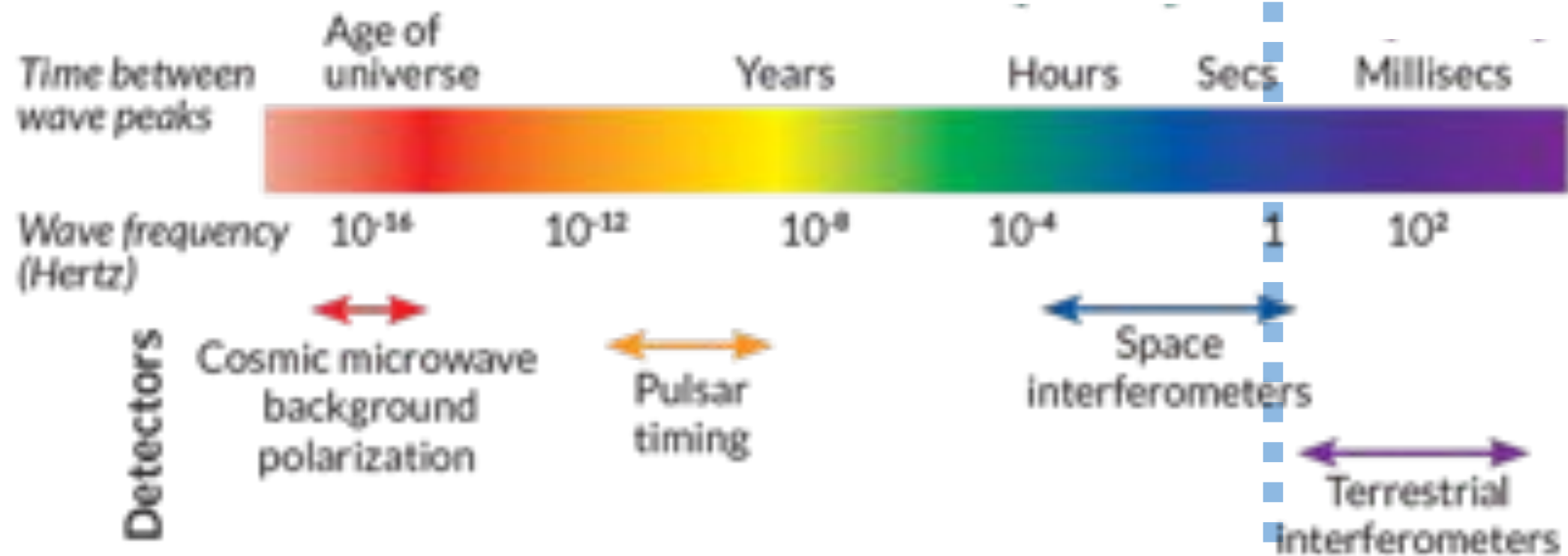


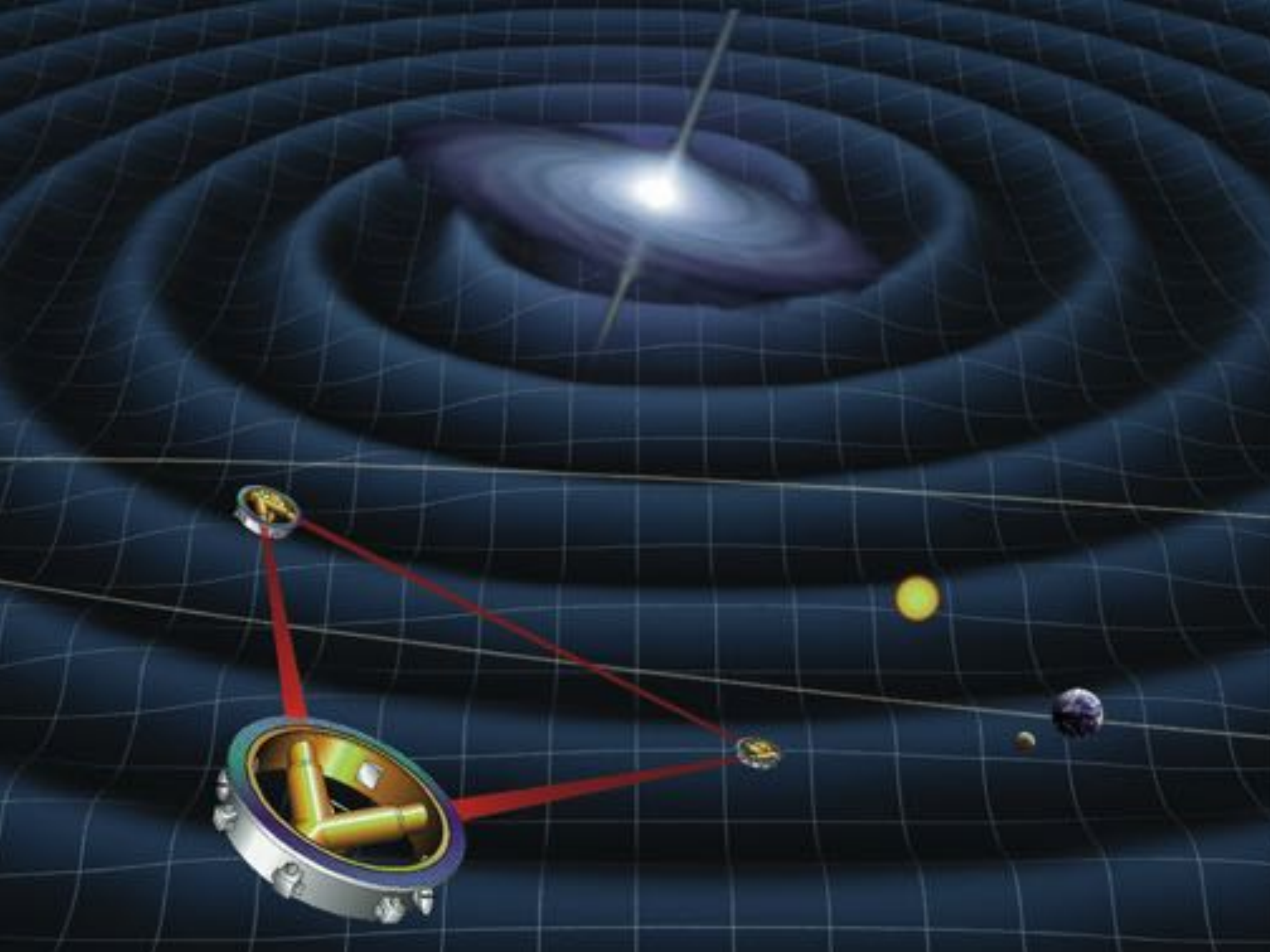


Test masses can not be on Earth



Test masses can not be on Earth





LASER INTERFEROMETER SPACE ANTENNA





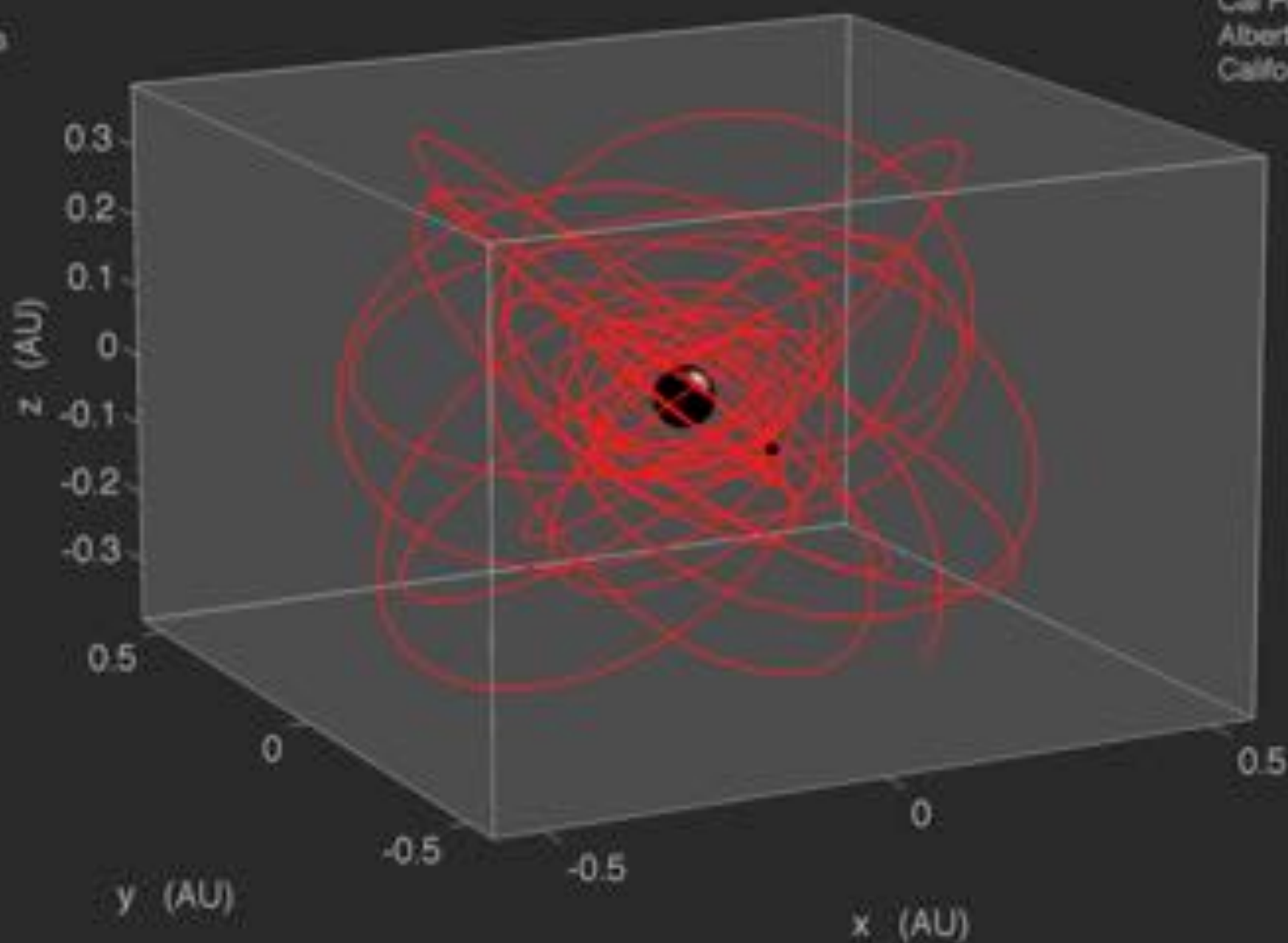
100 days before merger, 28% of light speed

Large black hole:
shown to scale
3,000,000 solar masses
90% maximal spin

Small black hole:
shown enlarged
270 solar masses
negligible spin

Trace duration
1 day

Steve Drasco
Cal Poly, San Luis Obispo
Albert Einstein Institute
California Institute of Technology



"plus" waveform viewed
from 45 degrees latitude



Scale = 0 kpc



LISA Pathfinder



Image: ESA/ATG Medialab

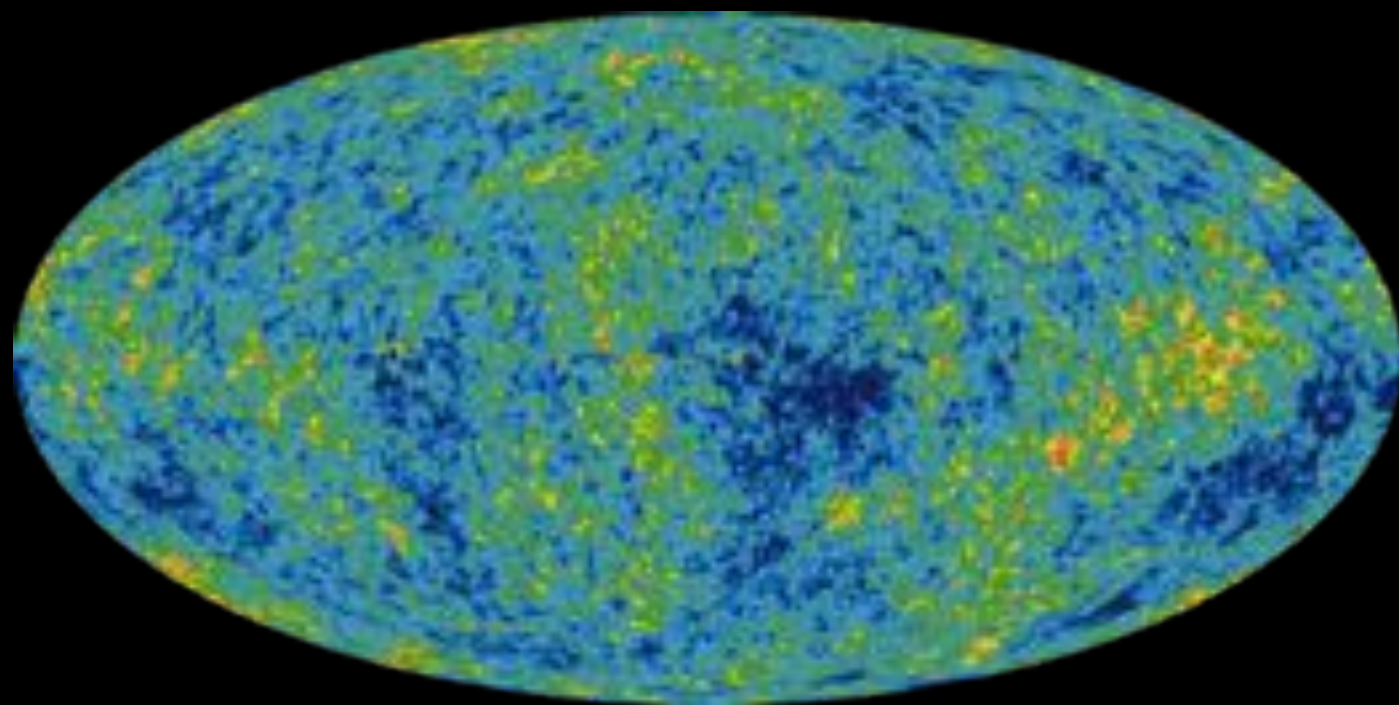


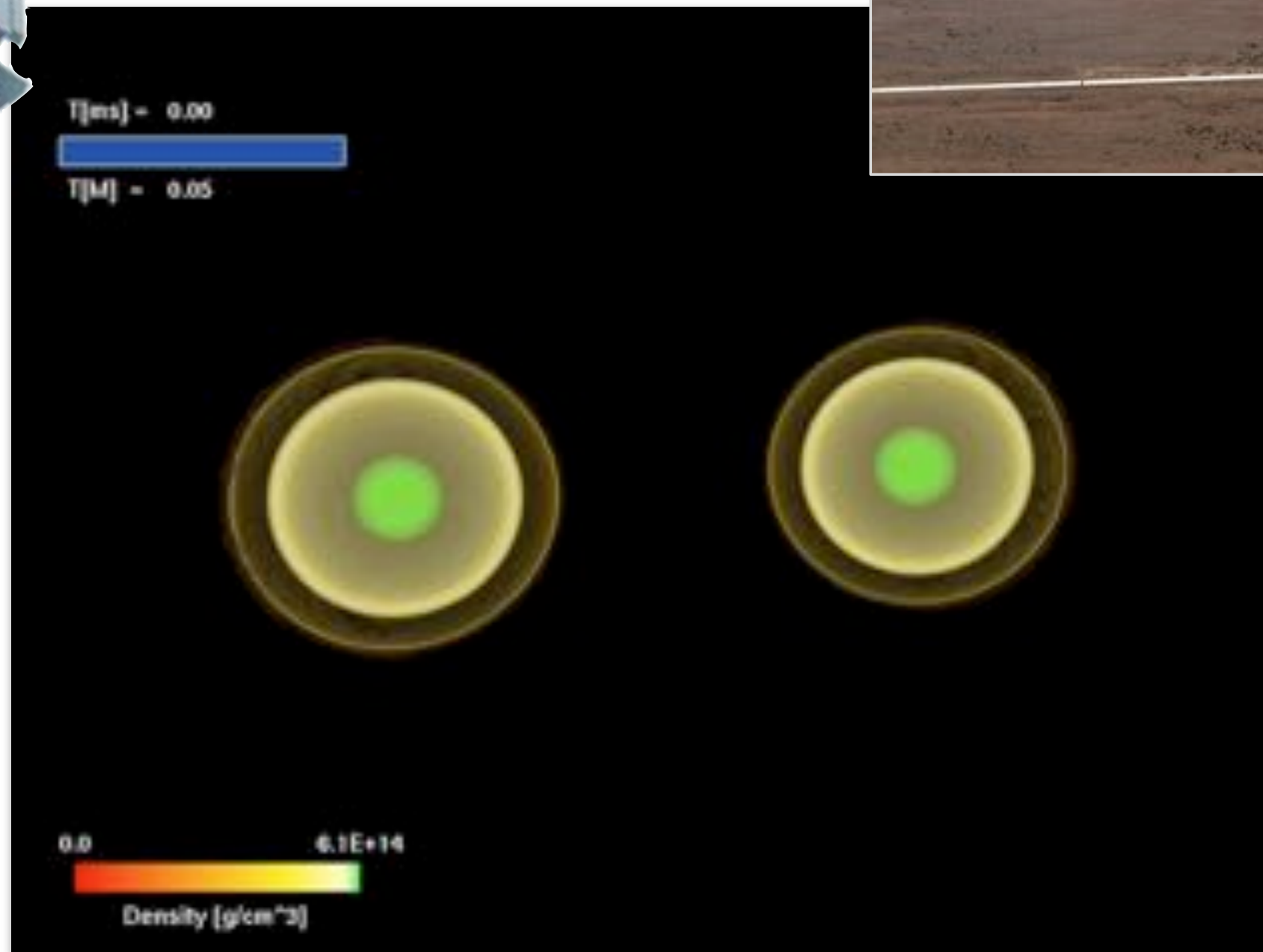
Image: ESA



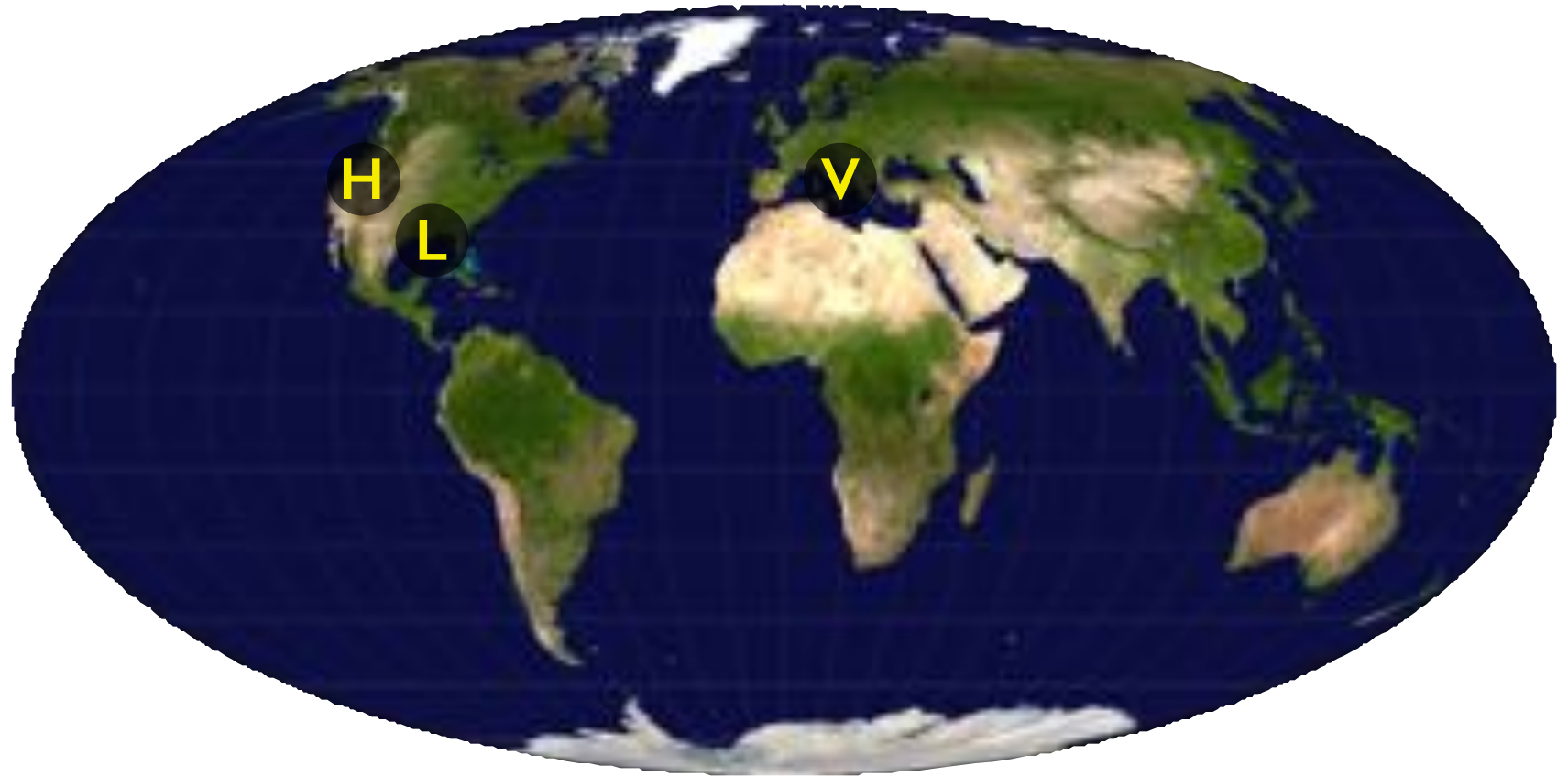
Image: ESA

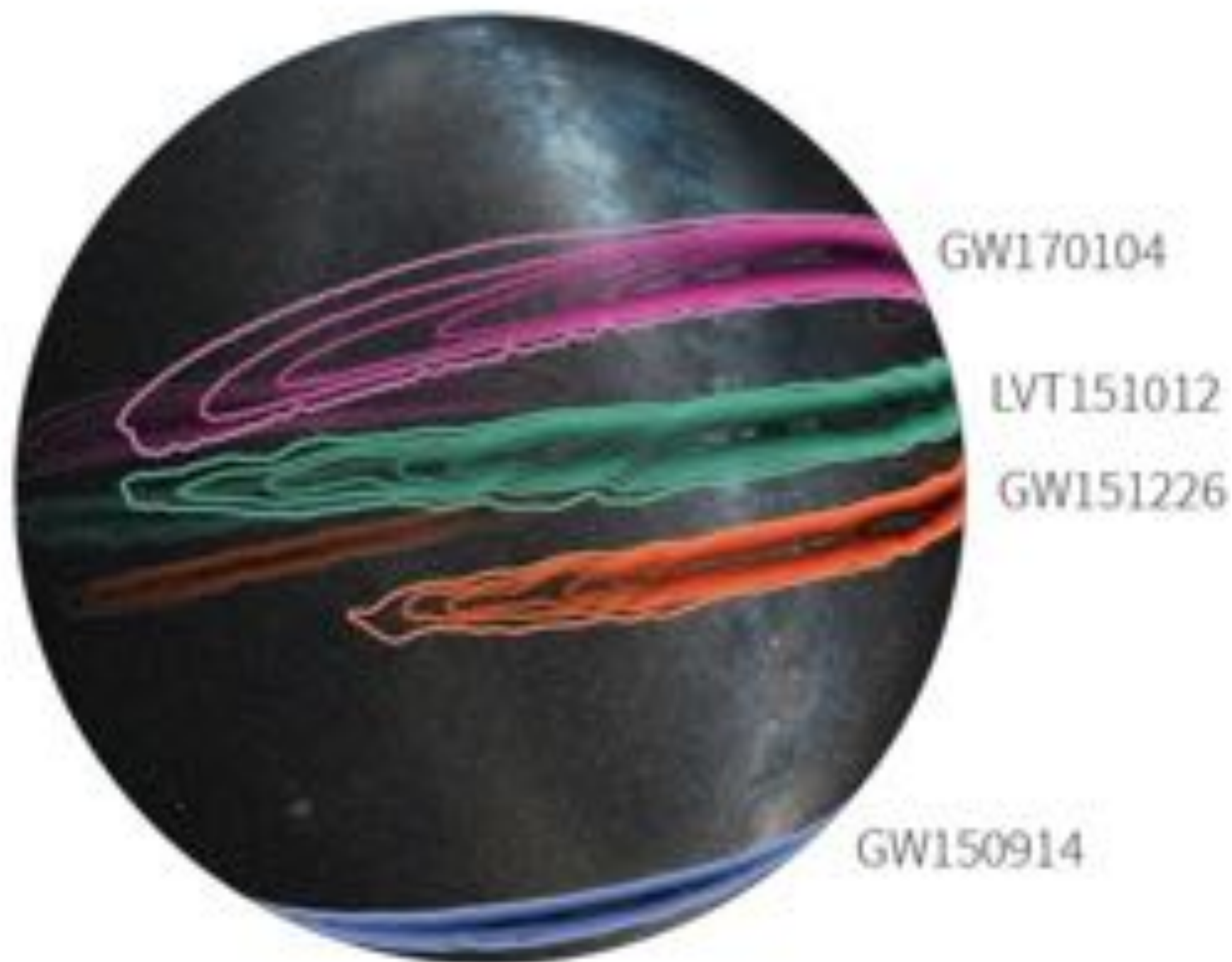


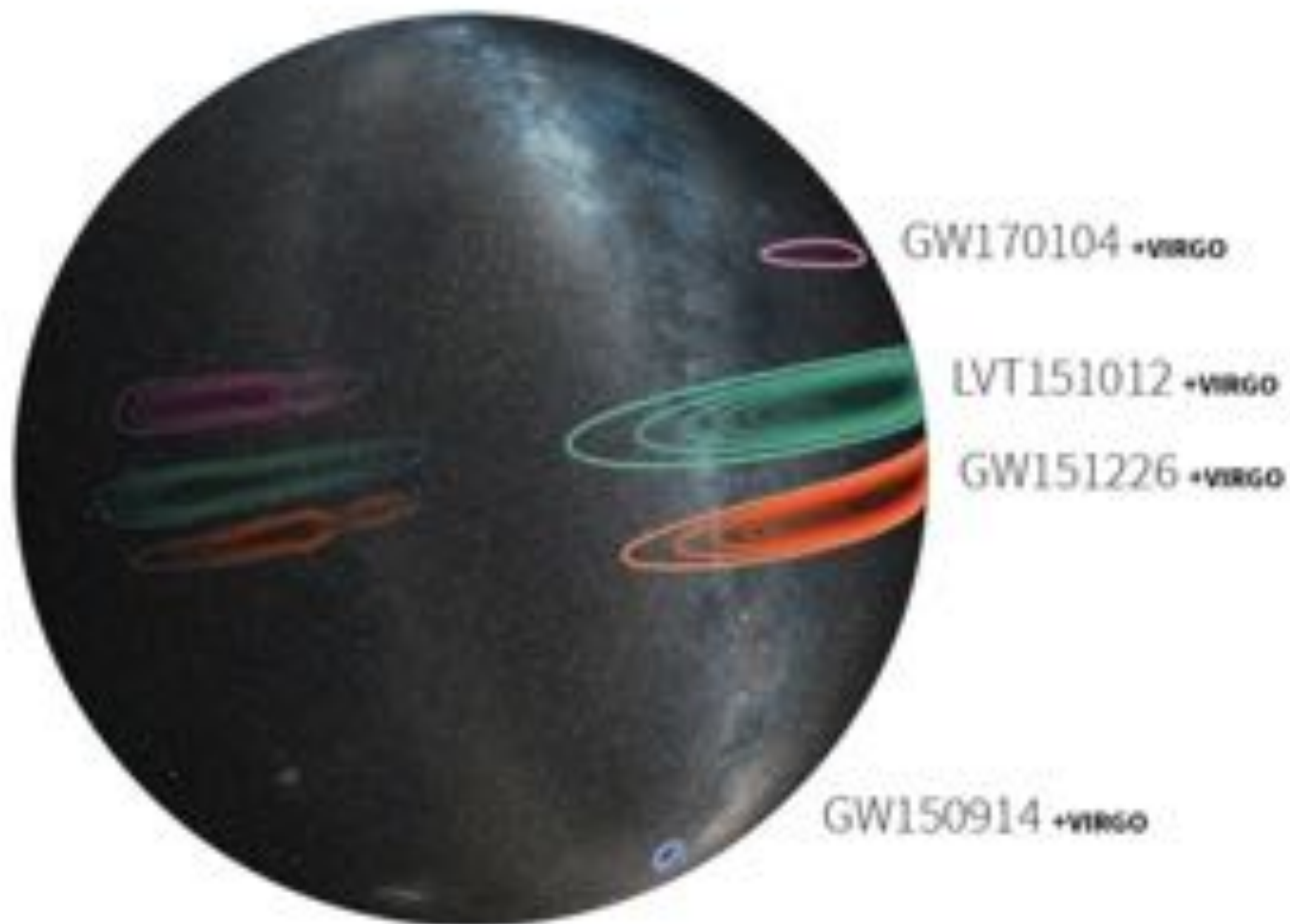


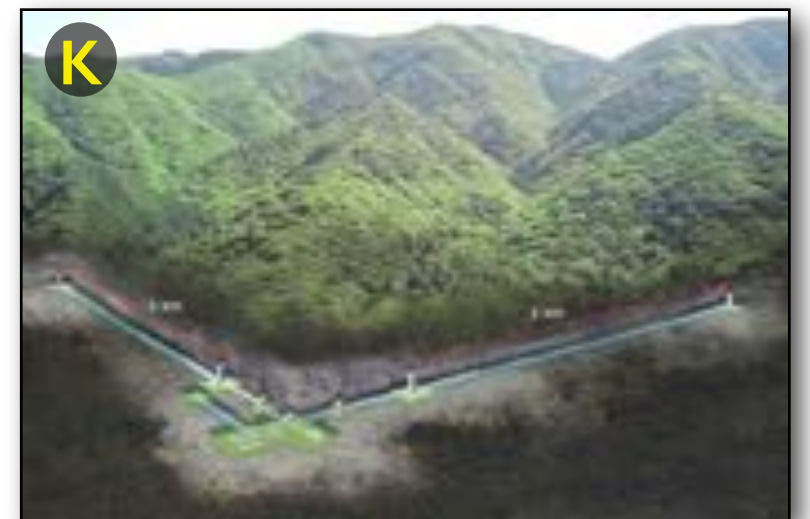
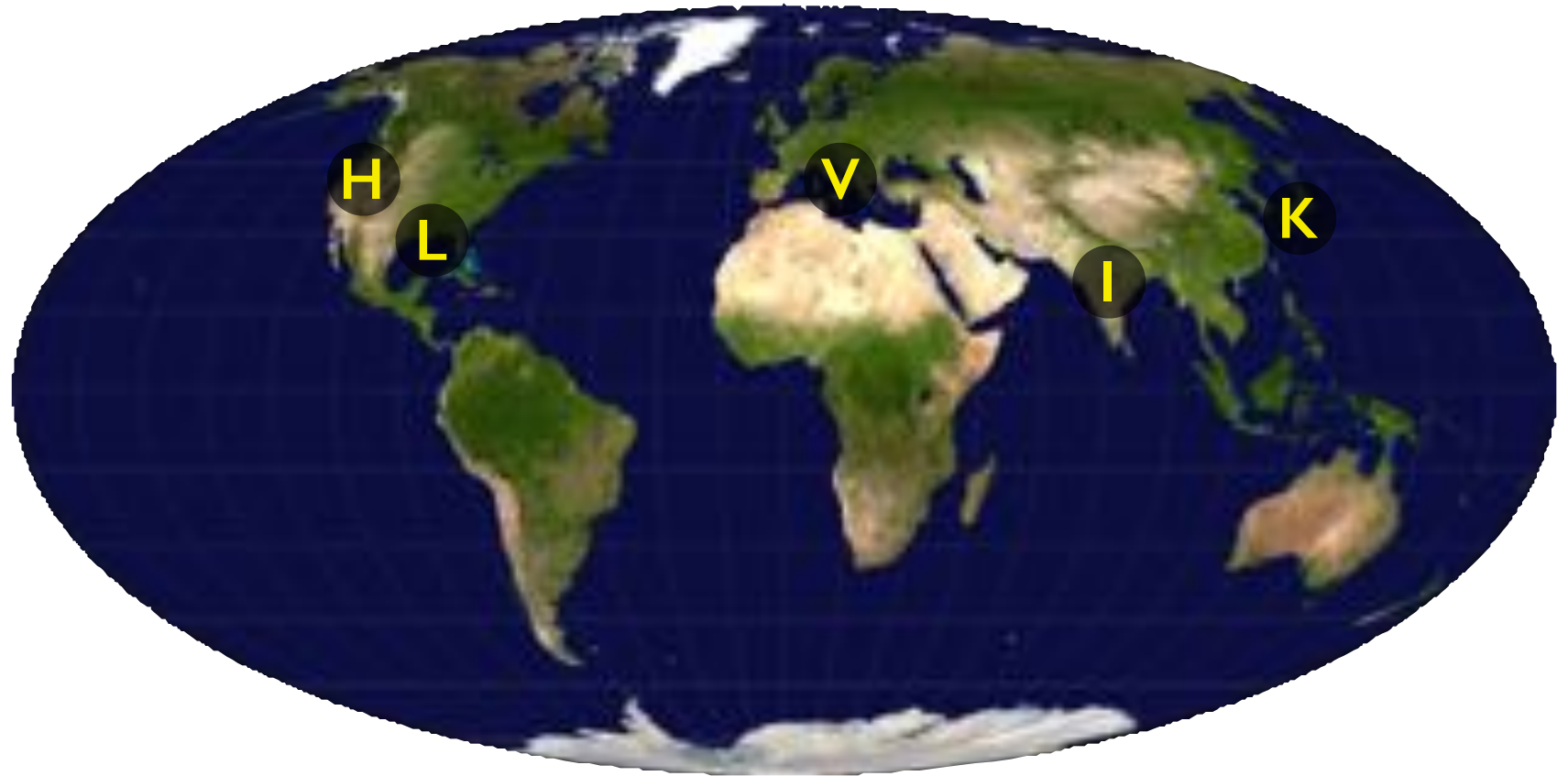




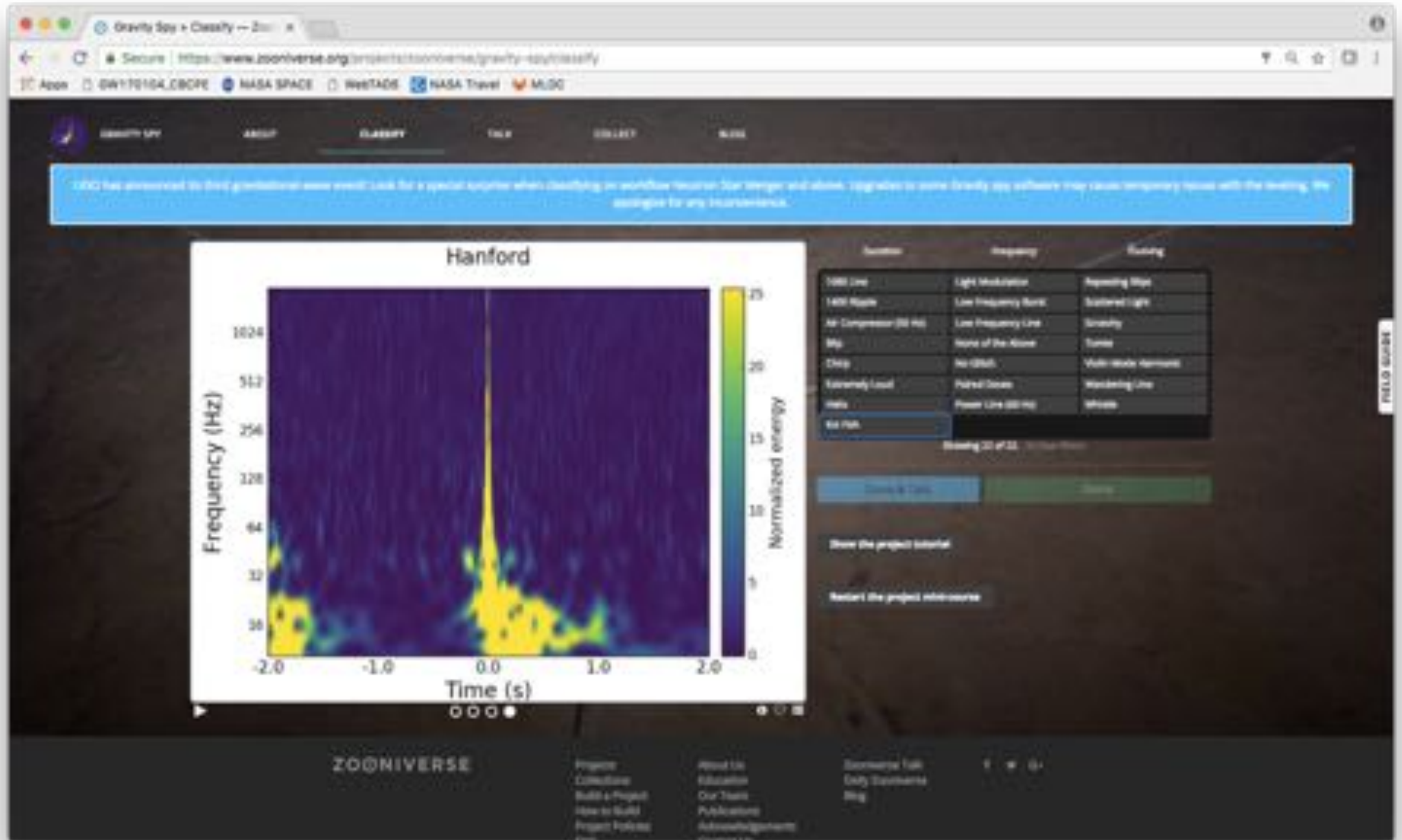




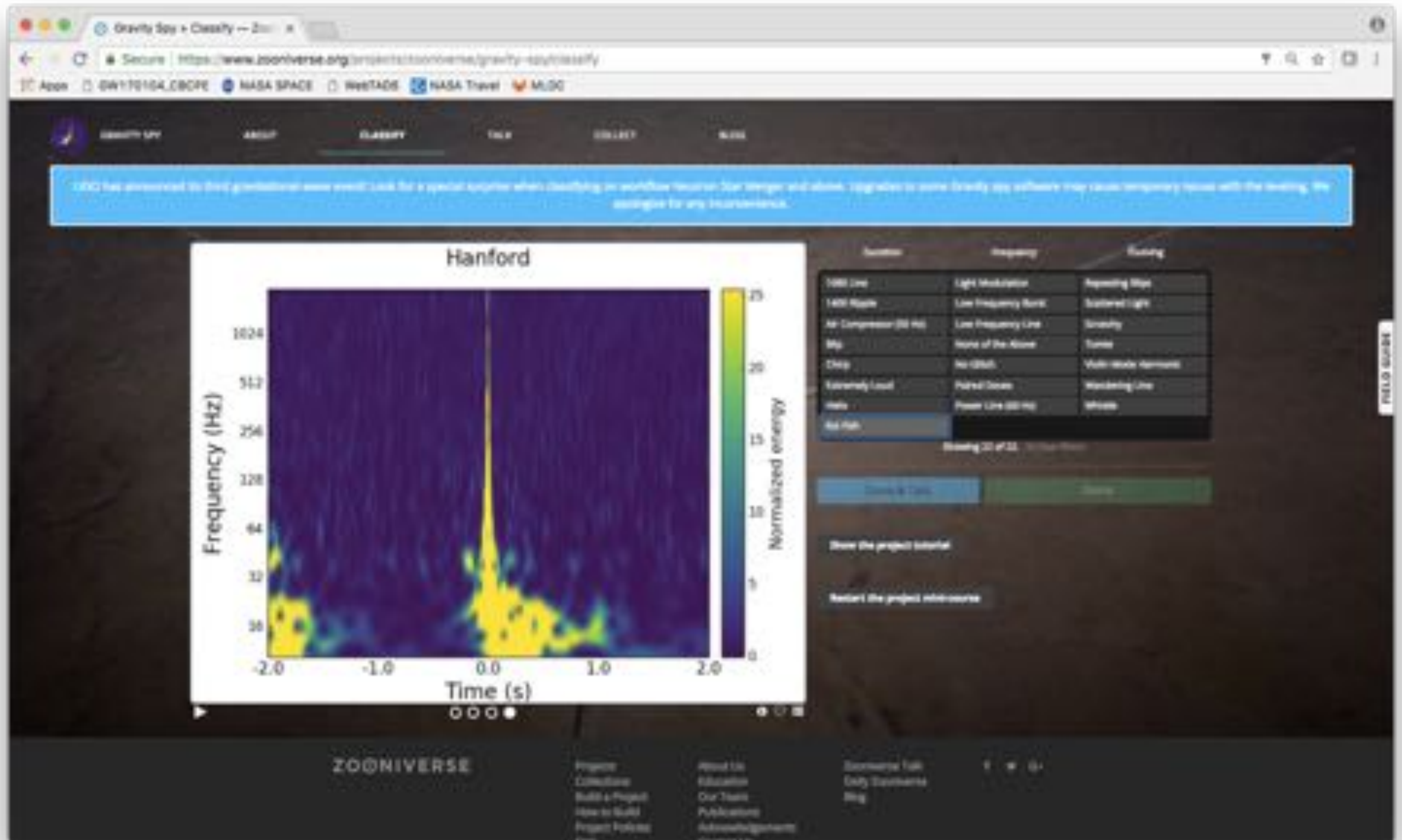




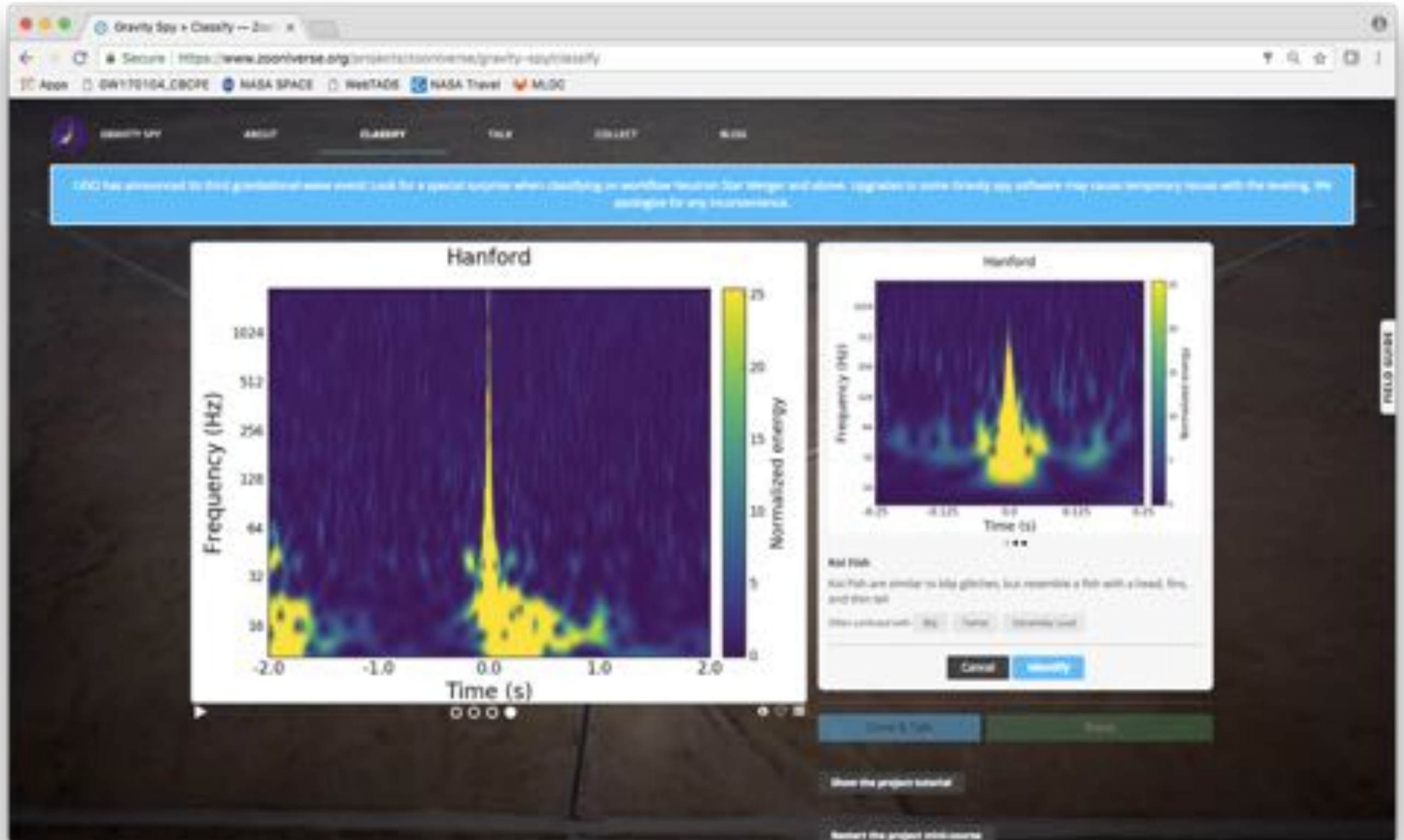
www.gravityspy.org



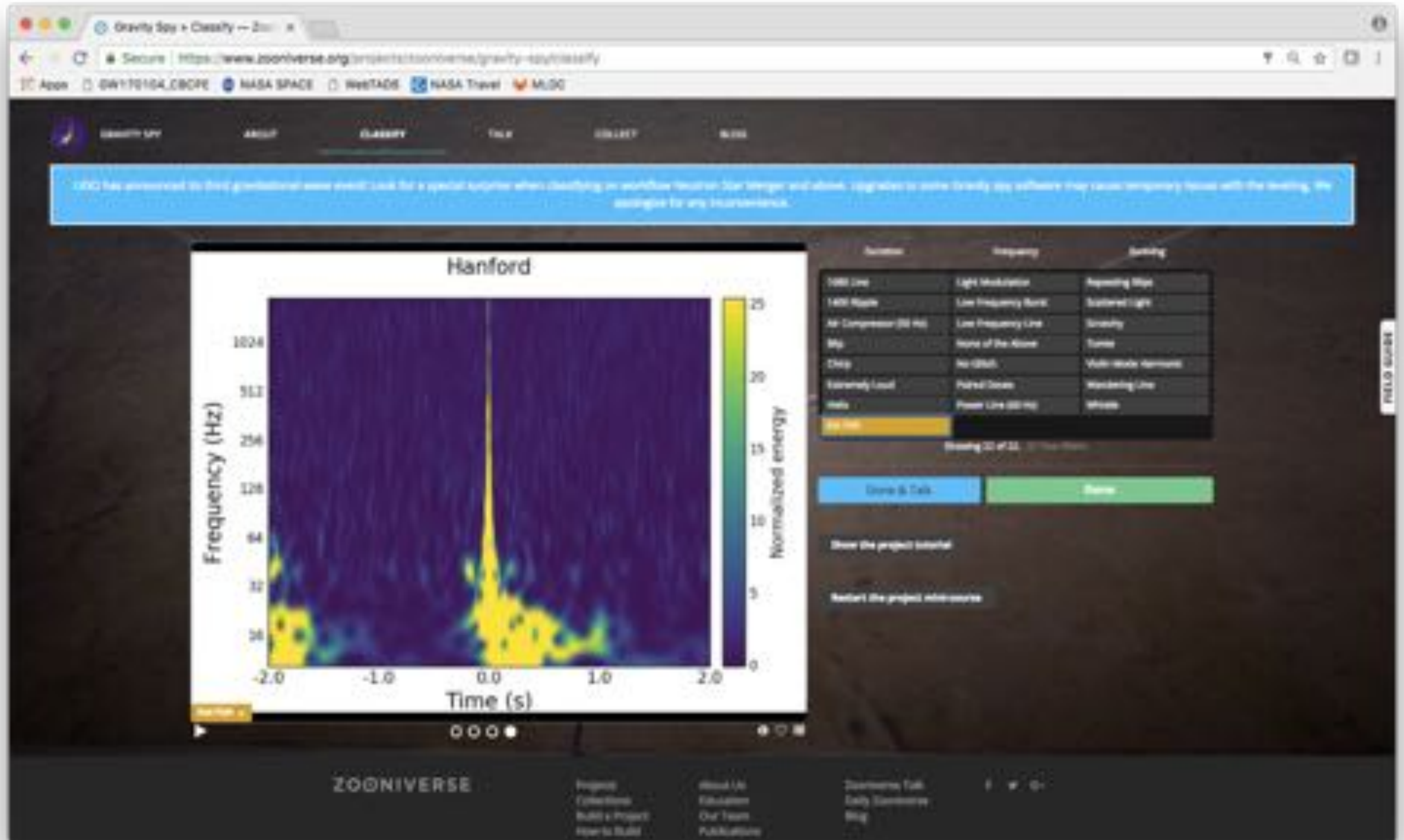
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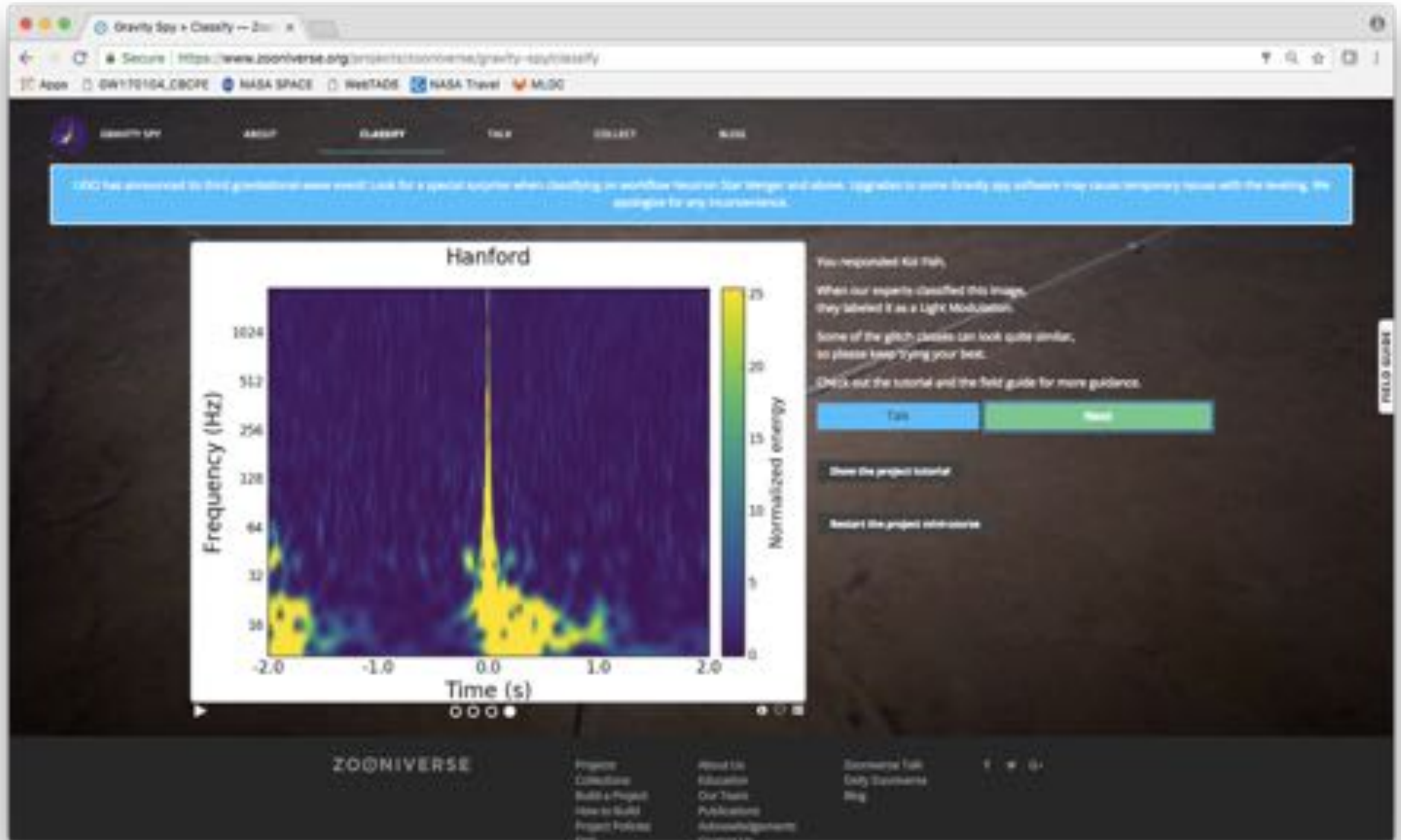
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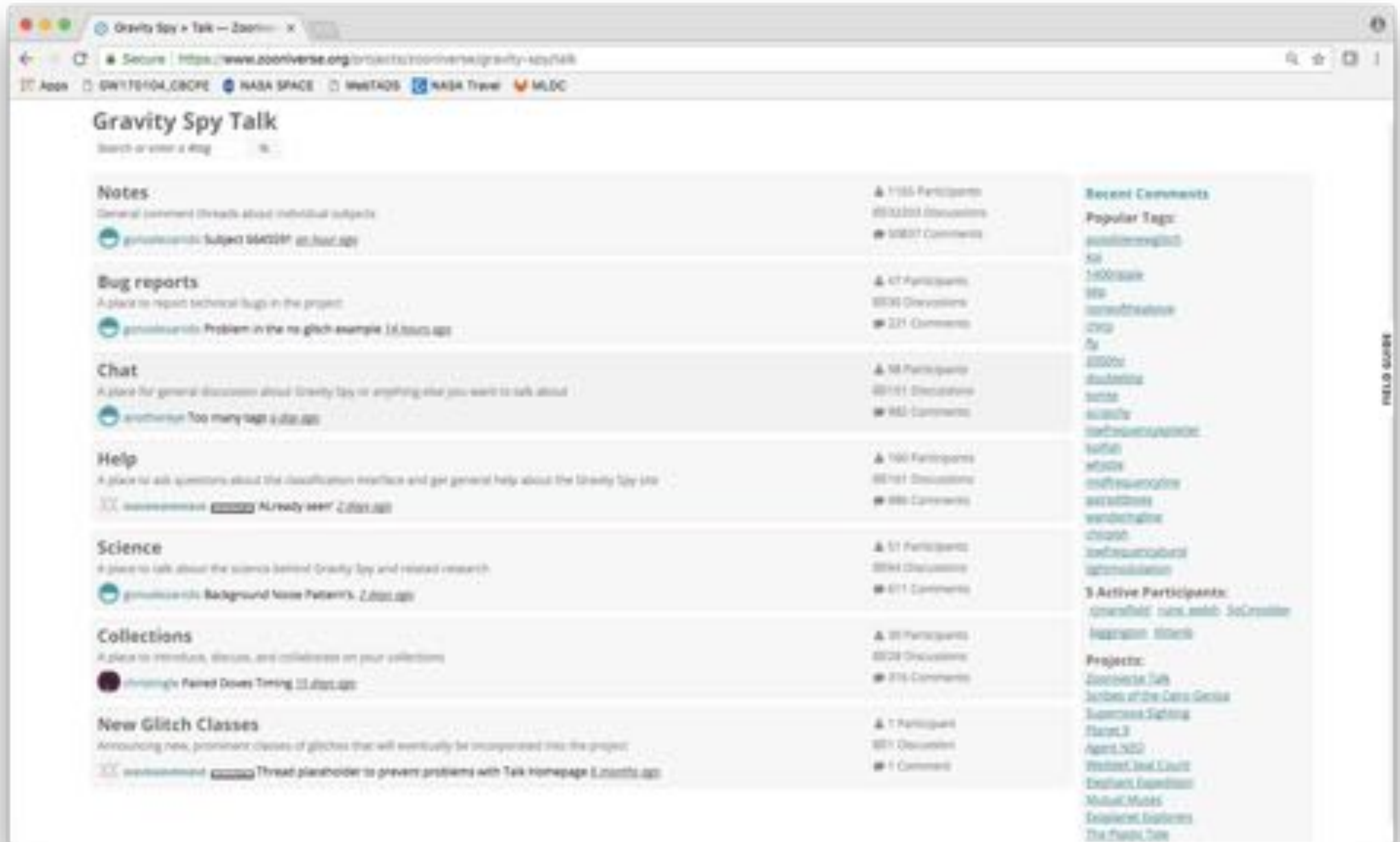
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Gravitational Wave Astronomy

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